

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of MUSA et al.	Attorney Docket # 1861A
Serial #	Examiner: Paul Michl
Filing Date:	Group Art Unit: 1714
Title: Die Attach Adhesives with Vinyl Ether and Carbamate or Urea Functionality	Date of this paper: 10 August 2001

Assistant Commissioner of Patents
Washington, DC 20231

Sir:

PRELIMINARY AMENDMENT

Kindly enter the following amendments to the application.

IN THE SPECIFICATION:

Insert after the title and before the Field of the Invention: "This is a continuation of US serial number 09/573,303.

On page 3, delete the first paragraph and insert instead: "Q is a linear or branched chain alkyl or cycloalkyl having 1 to 12 carbon atoms; a linear or branched chain alkylenoxy having 1 to 12 carbon atoms, or an aromatic or heteroaromatic ring or fused ring having 3 to 10 carbon atoms within the ring structure, in which the heteroatoms may be N, O, or S;"

IN THE CLAIMS:

Cancel claims 1 to 8, and add new claims 9 to 17.

REMARKS

Support for the amendment to the specification on page 3 can be found in original claim 1, and in the original first paragraph on page 3.

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In the parent application to this case, the Examiner rejected the claims over art showing vinyl ether compounds. Applicants respectfully traverse on the following reasoning.

Applicants' claims as now in this case are directed to adhesive compositions that are a mixture of vinyl ether compounds containing polar functionality (carbamate, thiocarbamate and urea) and maleimide compounds. Applicants believe the closest prior art is US 6,034,194 and 6,034,195. These patents disclose compositions containing maleimides and vinyl compounds that do not contain polar functionality.

Example 5 in applicants' specification compares two adhesive compositions containing maleimide and the inventive vinyl compounds containing polar functionality with a composition containing maleimide and dimer divinyl ether (DDVE). DDVE is the vinyl compound disclosed in this prior art and it does not contain polar functionality. The last table in Example 5 on page 11 shows that the vinyl ether compounds containing the polar functionality have superior adhesive strength. Applicants urge the Examiner to the conclusion that this unexpected result obviates the rejection.

Applicants request the Examiner to consider the application in light of the above argument and solicit an early allowance.

Respectfully submitted



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DIE ATTACH ADHESIVES WITH VINYL ETHER AND
CARBAMATE OR UREA FUNCTIONALITY

Insert > This is a continuation of US serial number 09/573,303.

FIELD OF THE INVENTION

This invention relates to die attach adhesives containing resins that contain both vinyl ether and either carbamate, thiocarbamate or urea functionality.

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BACKGROUND OF THE INVENTION

Adhesive compositions, particularly conductive adhesives, are used for a variety of purposes in the fabrication and assembly of semiconductor packages and microelectronic devices. The more prominent uses are the bonding of integrated circuit chips to lead frames or other substrates, and the bonding of circuit packages or assemblies to printed wire boards.

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There exist electron acceptor/donor adhesives that contain vinyl ethers as the donor compounds for use in low modulus adhesives, particularly in fast-cure adhesives for die attach applications. However, die attach adhesives containing commercially available vinyl ethers frequently suffer from poor adhesion, resin bleed and voiding due to the volatility and non-polar nature of these commercial vinyl ethers. Thus, there is a need for improved die attach adhesives utilizing vinyl ethers containing polar functionality in order to address these performance issues.

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SUMMARY OF THE INVENTION

This invention relates to die attach adhesive compositions containing resins that have vinyl ether and polar functionality, such as a carbamate, thiocarbamate or urea functionality, on a molecular (small molecule) or

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a linear or branched
chain alkylenoxy
having 1 to 12
carbon atoms;

Q is ~~an~~ ^{cycloalkyl} alkyl or alkylenoxy linear or branched chain having 1 to 12 carbon atoms; or an aromatic or heteroaromatic ring or fused ring having 3 to 10 carbon atoms within the ring structure, in which the heteroatoms may be N, O, or S;

5 X and Y are independently O, NR^1 , or S, in which R^1 is as described above, with the proviso that both X and Y cannot be oxygen or sulfur, and

Z is a branched or linear alkane, which may contain cyclic moieties, a siloxane, a polysiloxane, a C_1 to C_4 alkoxy-terminated siloxane or polysiloxane, a polyether, a polyester, a polyurethane, a poly(butadiene), or
10 an aromatic, polyaromatic, or heteroaromatic group.

Starting materials for preparation as the Z group are commercially available from a number of sources; for example, aromatic and polyaromatic materials may be obtained from BASF or Bayer; siloxanes and polysiloxanes from Gelest; polyethers from BASF; polyesters from Uniqema or Bayer;
15 poly(butadiene)s from Elf-Atochem; polyurethanes from Bayer or BASF; and the branched or linear alkanes from Uniqema. Some of these sources will have available Z materials already functionalized for reaction with a co-reactive functionality with the starting material containing the vinyl ether group; in other cases, the practitioner will need to functionalize the materials
20 in preparation for reaction with the vinyl ether starting material.

The exact composition or molecular weight of Z is not critical to the invention and can range widely depending on the requirements of the end use for the electron donor compound. The composition of Z can be chosen to give specific material properties in a final formulation, such as, rheological
25 properties, hydrophilic or hydrophobic properties, toughness, strength, or flexibility. For example, a low level of crosslinking and free rotation about polymeric bonds will impart flexibility to a compound, and the presence of